

Title: Designer Stamps

Brief Overview:

In this unit the students will conduct a survey to identify the most popular illustrations pictured on stamps and identify the trend of postage stamp costs. They will collect and analyze findings and display data using a variety of methods.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

- **Algebra**

- *Understand patterns, relations, and functions; and represent and analyze patterns and functions, using words, tables, and graphs.*
 - *Use mathematical models to represent and understand quantitative relationships; and model problem situations with objects and use representations such as graphs, tables, and equations to draw conclusions.*
 - *Analyze change in various contexts; investigate how a change in one variable relates to a change in a second variable; and identify and describe situations with constant or varying rates of change and compare them.*

- **Data Analysis and Probability**

- *Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; design investigations to address a question and consider how data-collection methods affect the nature of the data set; collect data using observations, surveys, and experiments; represent data using tables and graphs such as line plots, bar graphs, and line graphs; and recognize the differences in representing categorical and numerical data.*
 - *Select and use appropriate statistical methods to analyze data; and use measures of center, focusing on the median, and understand what each does and does not indicate about the data set.*

- *Develop and evaluate inferences and predictions that are based on data; and propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.*

- **Process Standards**

- **Problem Solving**

- *Instructional programs from prekindergarten through grade 12 should enable all students to build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; and apply and adapt a variety of appropriate strategies to solve problems.*

- **Communication**

- *Instructional programs from prekindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies of others; and use the language of mathematics to express mathematical ideas precisely.*

- **Connections**

- *Instructional programs from prekindergarten through grade 12 should enable all students to recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on one another to produce a coherent whole; and recognize and apply mathematics in contexts outside of mathematics.*

- **Representation**

- *Instructional programs from prekindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas; and select, apply, and translate among mathematical representations to solve problems.*

Grade/Level:

Grades 3-5

Duration/Length:

Approximately three to four days

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Constructing bar graphs and line graphs
- Analyzing displayed data
- Writing to persuade
- Recording tally marks

Student Outcomes:

Students will:

- Classify objects
- Conduct a survey
- Construct graphs using appropriate notations
- Apply knowledge of graph construction
- Identify measures of center
- Design and create a new stamp including investigating cost options
- Read and interpret a chart

Materials/Resources/Printed Materials:

- Graph paper (centimeter/inch squares)
- Canceled stamps (divided into small bags for 3 or 4 students to share) These should include a variety of subjects depicted on the stamps
- Student Resource Sheets
- Teacher Resource Sheets
- Crayons, markers, or any drawing materials
- Transparency of vignette

Development/Procedures:

Day 1

1. Introduce the unit by displaying the vignette transparency. (Teacher Resource Sheet #1)
2. Working in cooperative groups, students will categorize a bag of stamps into 4 or 5 groups.
3. The class will decide on the most frequently used categories and regroup their stamps accordingly.
4. After totaling the 4 or 5 class categories, the teacher, with student help, will construct a bar graph of the information. Included in the graph should be the X and Y axes, proper labels, scales, and titles (both the graph and axes).
5. The class will discuss the graph and note the theme (illustration) used most frequently on the stamps.
6. The students will copy the displayed data onto graph paper for later reference.
7. A survey of 20 people will be conducted tomorrow. The teacher may choose to assign Student Resource Sheet #1 for homework.

Day 2

1. Display Teacher Resource Sheet #1. The teacher will remind the students of the information learned from yesterday's lesson.
2. If the survey isn't done for homework, conduct the survey. (Student Resource Sheet #1). The students will complete observations of their surveys. (Student Resource Sheet #2).

3. The teacher will chart the totals of the class survey results. The students will transfer the class results to graph paper using a bar graph format (Student Resource #3). Be sure students include the elements of a graph (labels, titles, and appropriate scale). (Student Resource #4). Students will analyze the data and retain paper for later reference.
4. The students will calculate the centers of measure (mode, mean, median and range)
5. Based on the represented data from both completed graphs, the students will select a theme for their stamp. The students will design their stamp. (Student Resource Sheet #5).

Day 3

1. Display Teacher Resource Sheet #1. The teacher will remind the students of the information learned from yesterday's lesson.
2. Discuss the internet data entitled "U.S. Letter Rates since the Civil War." (Student Resource Sheet #6). The teacher can either have the students construct a line graph of the change of postage rates over time (Student Resource #7) or use Student Resource #8.
3. The students will analyze the data. Students will identify a trend of the data. Students will retain the graph for further reference.

Day 4

1. The students will complete the assessment task. (Student Resource Sheet #9)

Performance Assessment:

Student will be assessed informally using the following criteria:

- Tally chart--titled and complete

Student will be assessed formally using the following criteria:

- Bar graph--completely labeled and titled
- Scoring rubric for stamp design (Student Resource Sheet #10, Teacher Resource Sheet #3)
- Scoring rubric for persuasive letter (Student Resource Sheet #10, Teacher Resource Sheet #3)

Extension/Follow Up:

- Time lines can be made about the history of stamps. Information can be found at: www.usps.gov/history/his1.html.
- Use the WEE Delivery program school-wide.
- Create a stamp club.
- Contact the local post office for information or visit www.infoplease.com/ipa/A0878163.html for more data about the post office.

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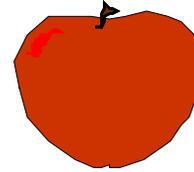
Vignette

The post office has designated May as “Marvelous Math” month. To commemorate this special month, your class has been asked to design a new stamp. Before you begin, it is important to investigate stamp themes. You will also need to investigate an appropriate cost for your stamp. Finally, you will write a letter to Mr. Lic M. Stamp persuading him to choose your stamp for distribution.

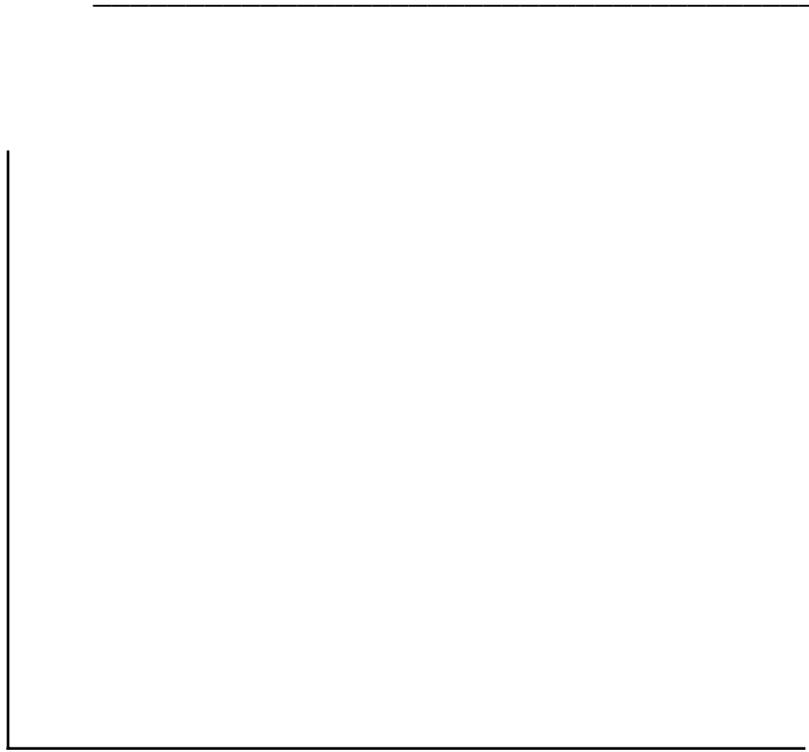
WHAT IS YOUR FAVORITE ILLUSTRATION ON A STAMP?

Conduct a survey of 20 people asking each person the question above. Tally the results of your survey in the frequency chart below.

ILLUSTRATION	TALLY	FREQUENCY
<p>ANIMALS</p> 		
<p>PLANTS</p> 		
<p>CARTOONS</p> 		
<p>FOOD</p> 		
<p>OBJECTS</p> 		



Using the data you have collected,
write three things you observe about
the data.



Mean _____

Mode _____

Median _____

Range _____

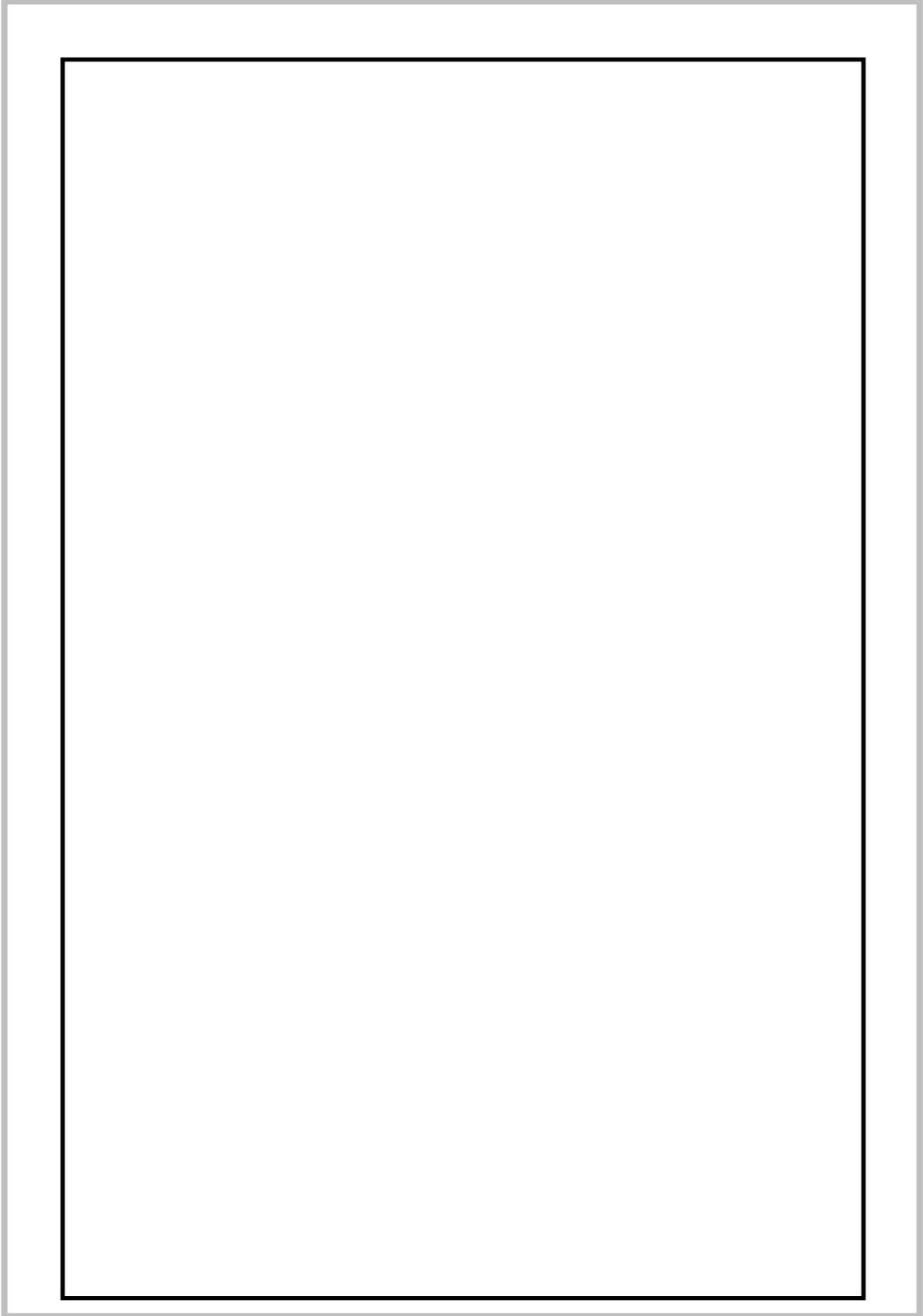
Write three observations for the graph.

Scoring Rubric for Graphs

- 3 Title is provided and describes data shown.
Data displayed at equal intervals (0 must be included if applicable to display).
Labels provided and correctly describes data.
Key is accurate and complete.
- 2 One of the above is incomplete.
- 1 Two pieces are incomplete.
or
One piece is missing.
- 0 Blank, off-topic, or illegible response.

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- 3 Title is provided and describes data shown.
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United States - Postal Regulations

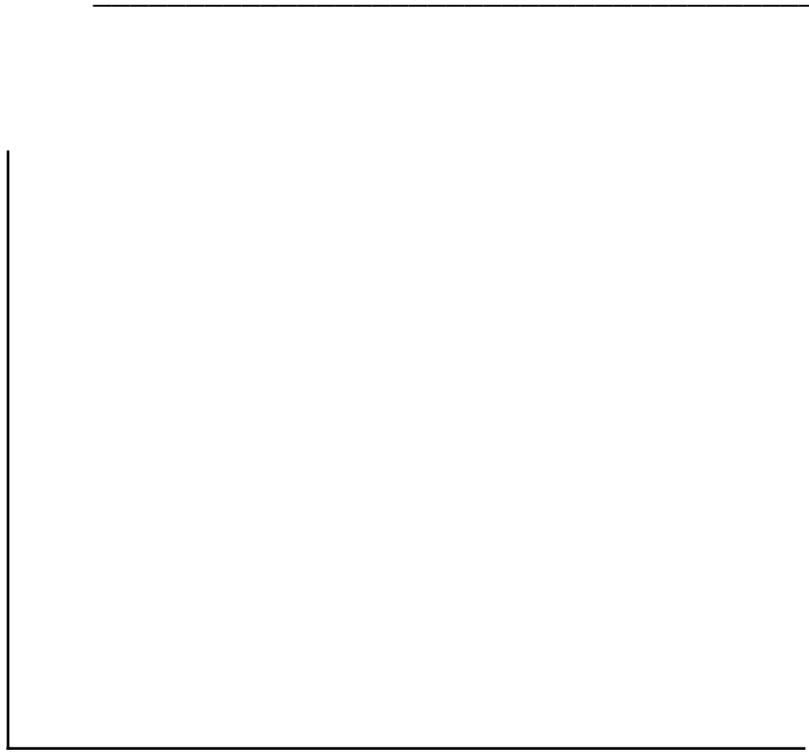
U.S. Letter Rates Since the Civil War

The first U.S. postage stamps were issued on July 1, 1847. At that time, postal rates varied by distance traveled - under 300 miles, letters cost 5 cents per 1/2 oz; over 300 miles, letters cost 10 cents per 1/2 oz. (These rates fluctuated in the decade that followed.) Until prepayment became mandatory on April 1, 1855, Americans had the option to pay collect, which could entail higher rates.

Since July 1, 1863, letters sent to all parts of the United States have been charged at the same rate.

July 1, 1863	3 cents per 1/2 oz.
Oct. 1, 1883	2 cents per 1/2 oz.
July 1, 1885	2 cents per 1 oz.
Nov. 2, 1917	3 cents per 1 oz.*
July 1, 1919	2 cents per 1 oz.
July 6, 1932	3 cents per 1 oz.
Aug. 1, 1958	4 cents per 1 oz.
Jan. 7, 1963	5 cents per 1 oz.
Jan. 7, 1968	6 cents per 1 oz.
May 16, 1971	8 cents per 1 oz.
March 2, 1974	10 cents per 1 oz.
Dec. 31, 1975	13 cents per 1st oz.**
May 29, 1978	15 cents per 1st oz.
March 22, 1981	18 cents per 1st oz.
Nov. 1 1981	20 cents per 1st oz.
Feb. 17, 1985	22 cents per 1st oz.
April 3, 1988	25 cents per 1st oz.
Feb. 3, 1991	29 cents per 1st oz.
Jan. 1, 1995	32 cents per 1st oz.
Jan. 10, 1999	33 cents per 1st oz.
Jan. 7, 2001	34 cents per 1st oz.

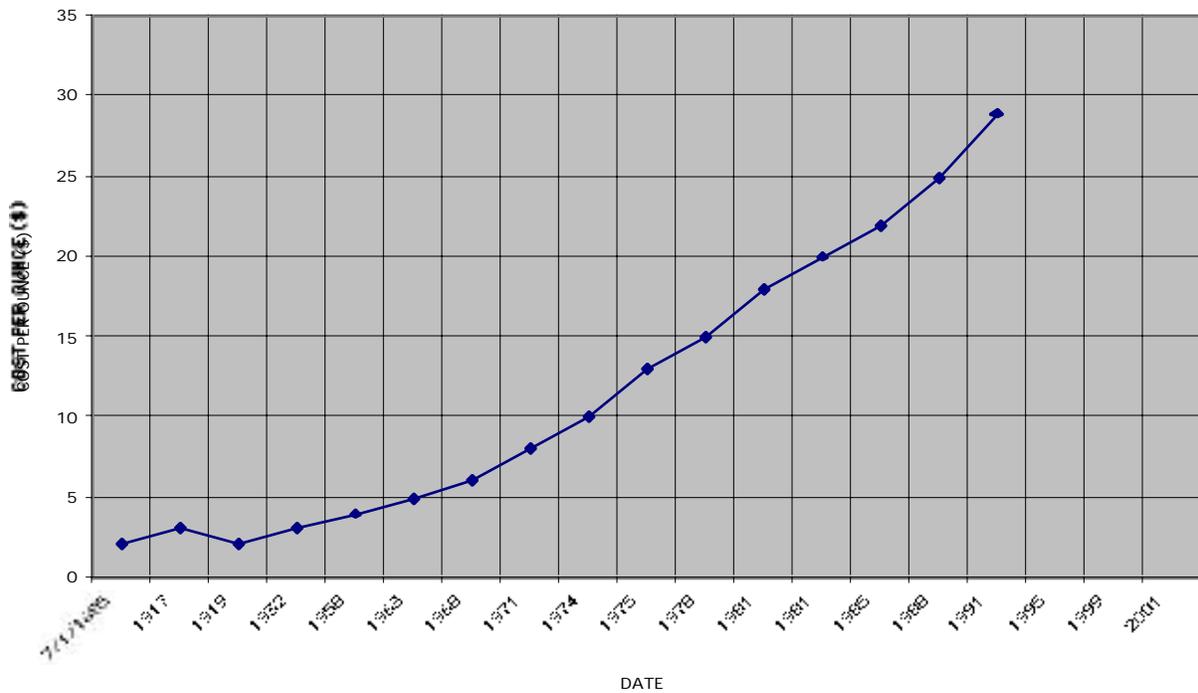
*A temporary cost increase to aid the war effort. **Since Dec. 31, 1975, weight in excess of one oz. has been charged at a lower rate. For instance, the current rate is 34 cents for the first oz. and 21 cents for each additional oz.



Write three observations for the graph.

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Oct. 1, 1883	2 cents per 1/2 oz.
July 1, 1885	2 cents per 1 oz.
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Jan. 7, 2001	34 cents per 1st oz.

U.S. POSTAGE RATES



Add the data for 1995, 1999, 2001 to the line graph.
 Predict what a stamp for a letter will cost in the year 2005. _____
 Explain how you determined your prediction.

DESIGNER STAMP

The post office has designated May as “Marvelous Math” month. To commemorate this special month, our class has been asked to design a new stamp. Write a letter to persuade the postmaster, Mr. Lic M. Stamp, to choose your stamp.

Before you begin, think about the picture on your stamp. Think about the cost of your stamp. Remember to explain how math is a part of your stamp.

Now, write a letter to Mr. Lic M. Stamp persuading him to choose your stamp for distribution. Enclose your stamp design (be sure to include the price) with your letter.

RUBRIC FOR STAMP DESIGN

- 1 Design is appropriate for data collection.
Cost of stamp is appropriate for data collection.
- 0 Incomplete, blank or off-topic.

RUBRIC FOR LETTER

- 3 Letter form is correct including date, appropriate opening, appropriate closing, and signature.
Appropriate support is given for design and cost.
Explanation is given for how math is a part of the stamp.
Persuasive letter has been written.
0-3 grammatical errors (capitalization, organization, punctuation, and spelling).
- 2 Two of the above are incomplete.
4-6 grammatical errors.
- 1 Three of the above are incomplete.
More than 6 grammatical errors.
- 0 Blank, off-topic, or illegible response.

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